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(56) Documents Cited
GB 2281174 A GB 2265793 A US 5349580 A

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UK CL (Edition N) **H4K KOD8 KOT , H4L LDG LDSJ LDSX**
INT CL^6 **H04Q 7/22 7/38**
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(54) Channel/Bandwidth Assignment in a Communication System

(57) A radio communication device (103), includes different modules (123, 125) providing access to different radio communication services. Upon adding or deleting modules (123, 125) to and from the radio communication unit (103), the radio communication system (100) reconfigures the channel providing radio communication services to the radio communication unit (103). Specifically, when a voice-only radio communication unit is communicating over a radio channel to a base site transceiver (101) the channel bandwidth requirements are minimal. Upon connection of the voice-only radio communication unit to a peripheral device (301, 401) providing simultaneous video, the radio communication unit (103) sends a signal to the base site transceiver (101) updating the service capability. In response thereto, the base site transceiver (101) modifies the records and adjusts the capabilities of the assigned channel in response to the received signal. Thereby delivering simultaneous video and voice to the radio communication device (103).

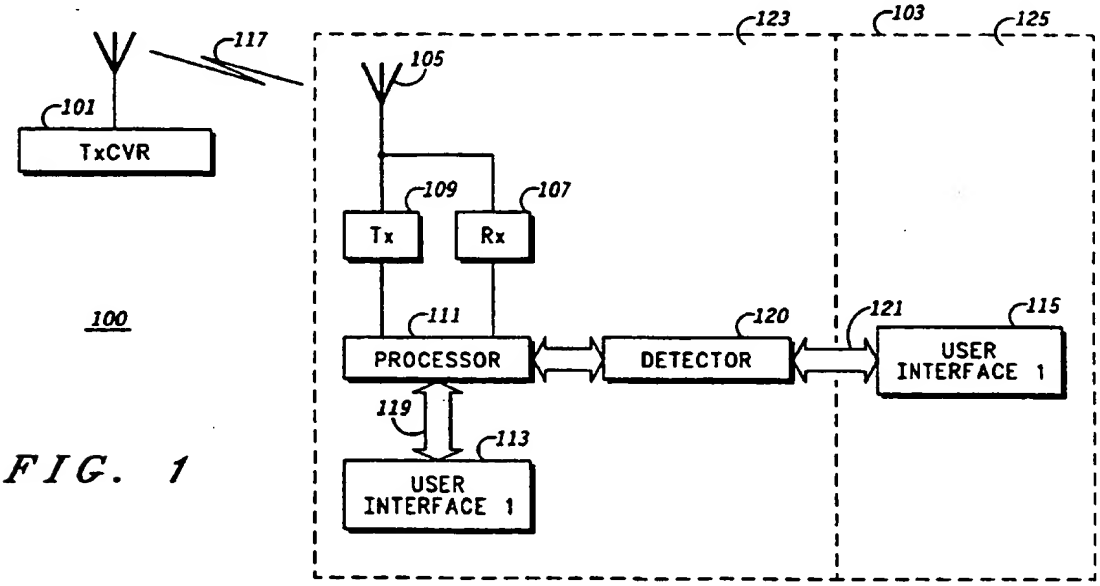

FIG. 1

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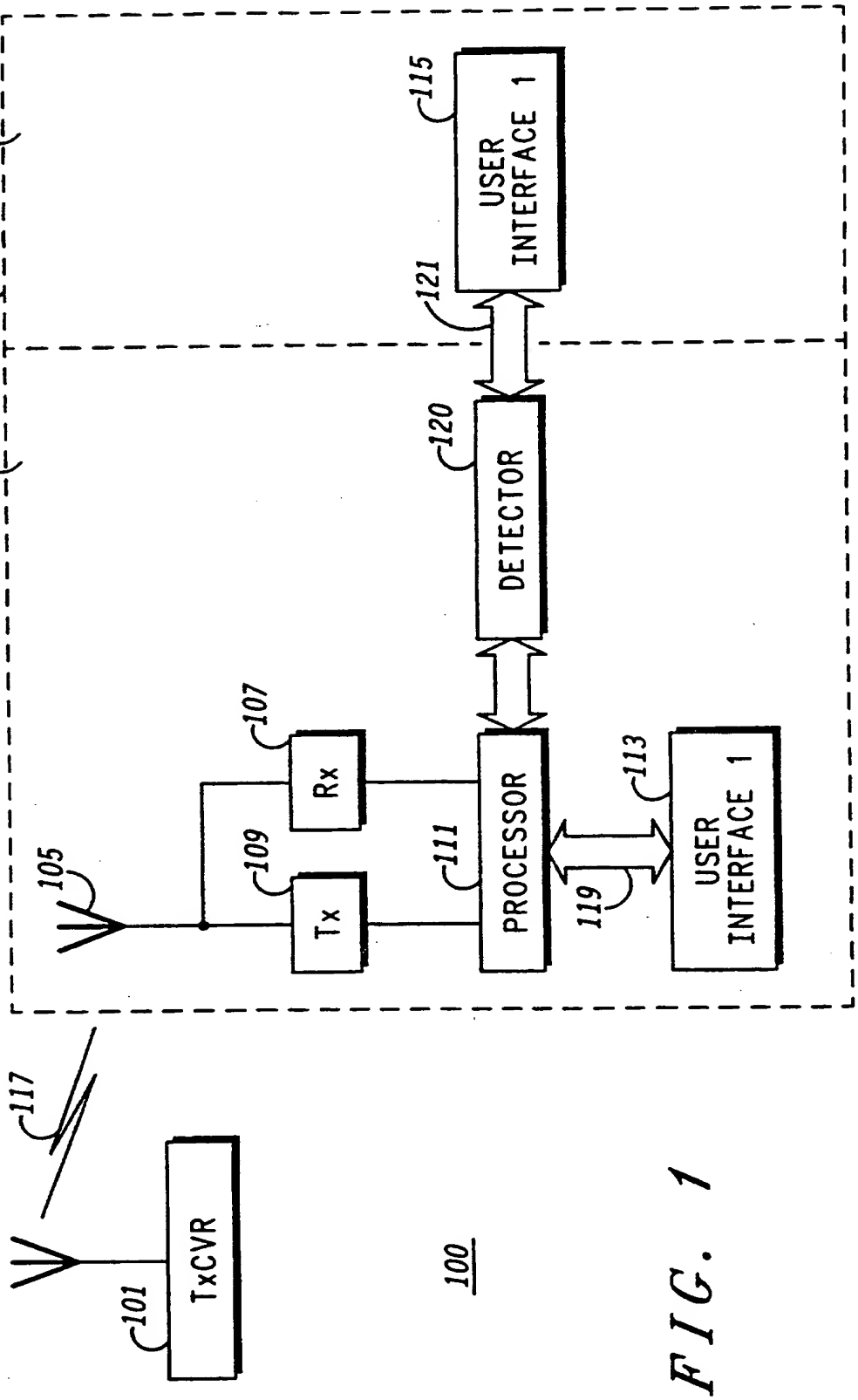

FIG. 1

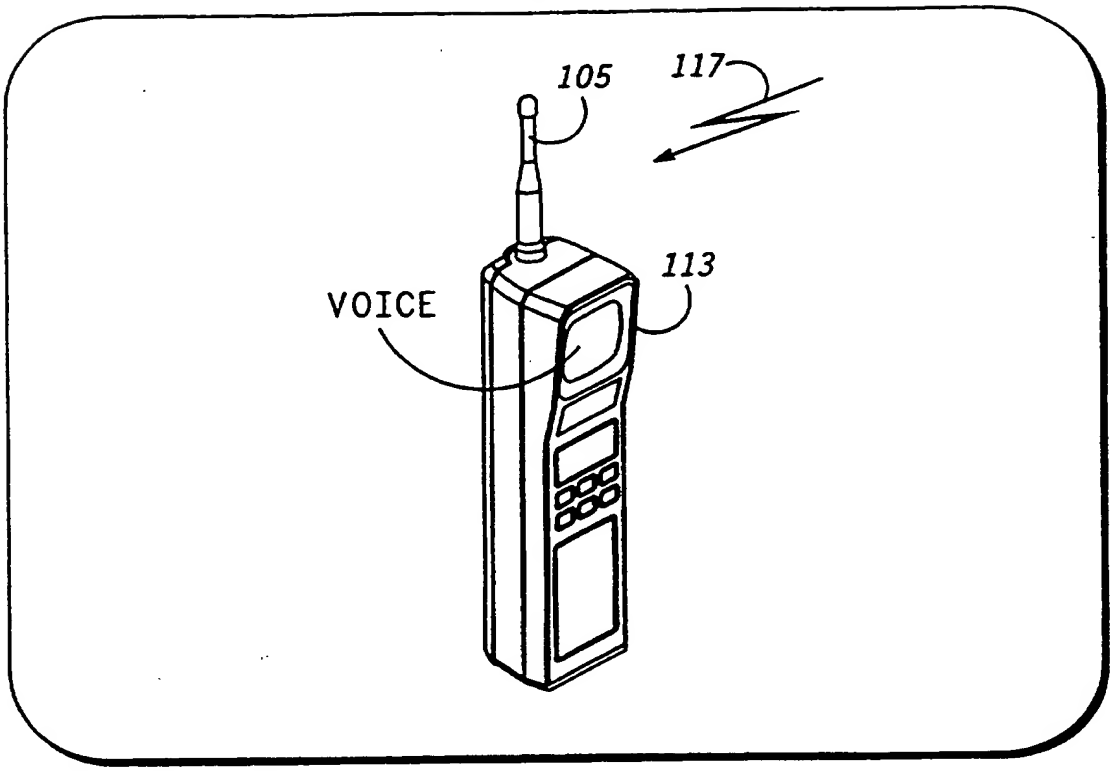

FIG. 2

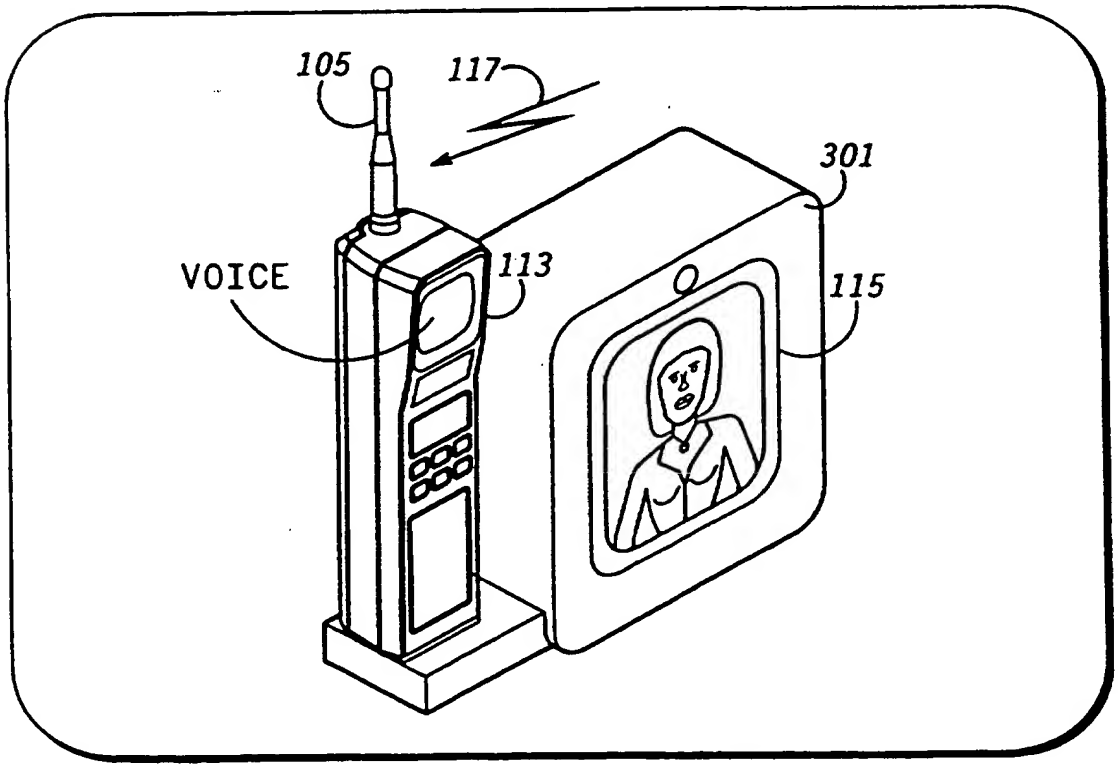

FIG. 3

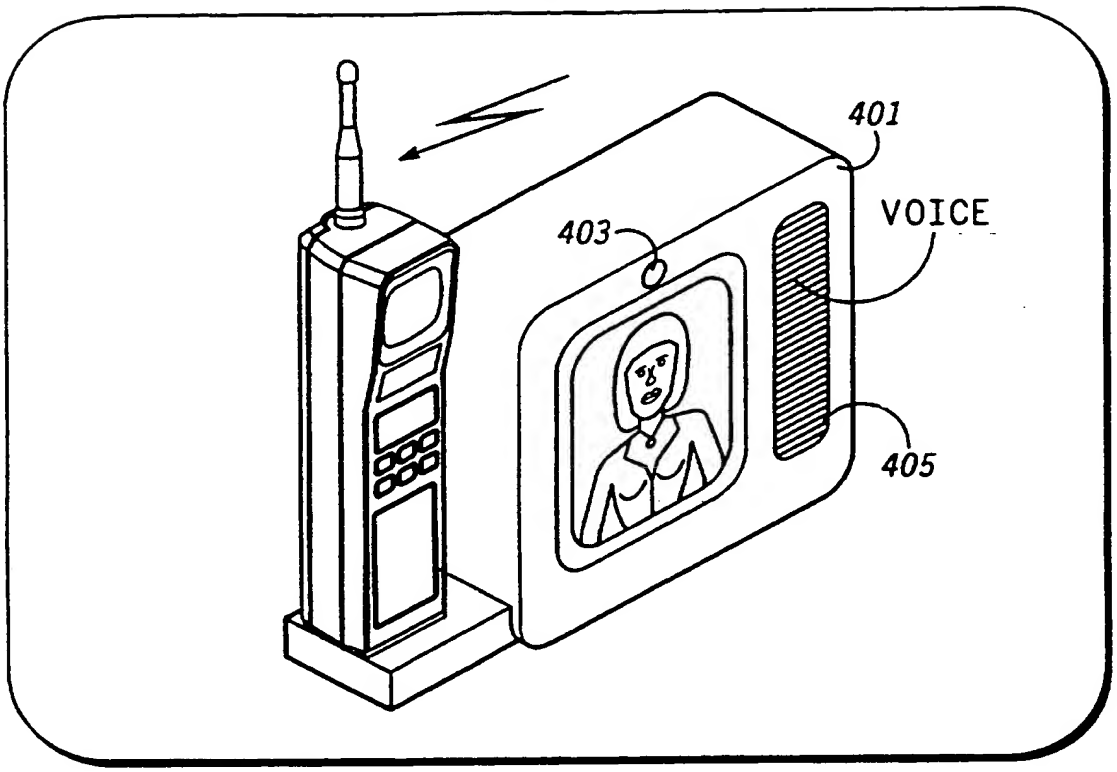

FIG. 4

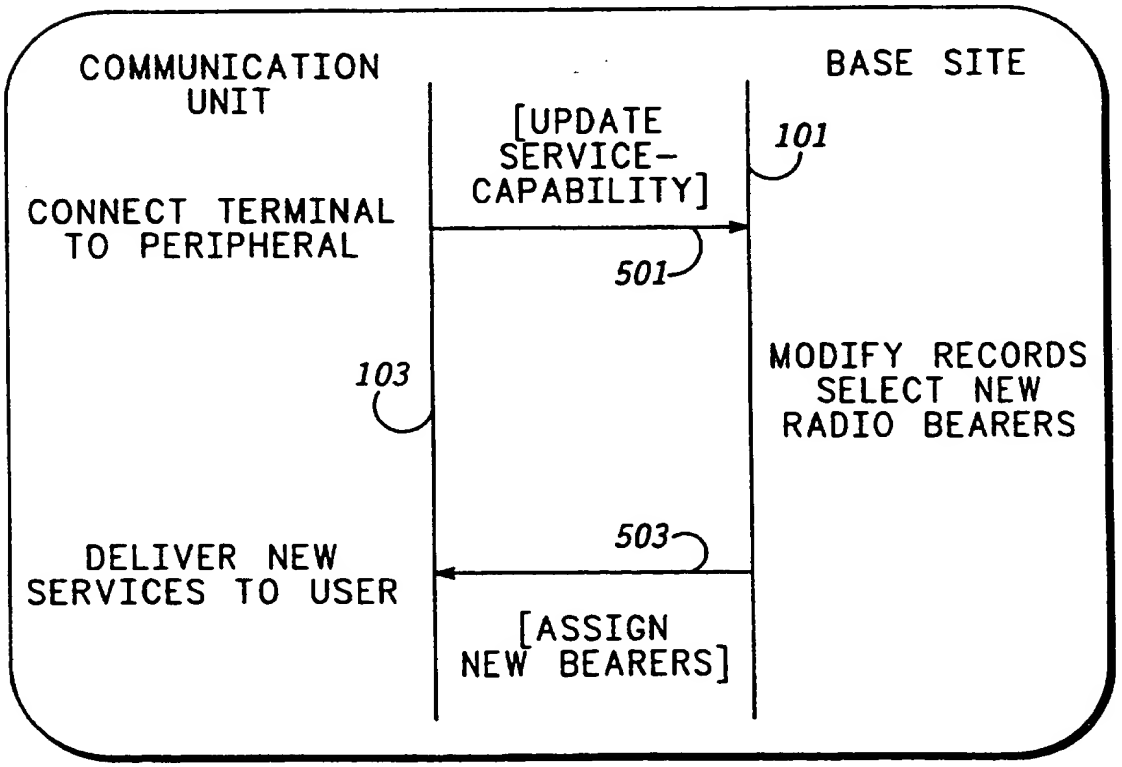

FIG. 5

COMMUNICATION SYSTEM

Field of the Invention

Generally, the present invention relates to communication systems and more particularly to adapting a communication system to the requirements of a communication system user.

Background of the Invention

The next generation of wireless radio communication services will bring multi media capability (e.g. simultaneous voice, video and text) and the possibility of a single radio communication device for use in all the user environments (e.g. business, domestic and vehicular). It is envisioned that the users communication requirements will vary from time to time. For example, frequently the users domestic communications may only require speech communication whereas during the business hours they may require to provide full multi media service including integrated speech telephony video and text all of the highest most reliable performance. Accordingly, it is desirable to have a communication system that adapts to the needs of the user as well as a communication unit that adapts to the needs of the user.

Summary of the Invention

The present invention provides a communication system comprising a communication device capable of communicating using a plurality of communication services; and a communication channel for providing communication between the communication device and a base site transceiver, the communication channel having a bandwidth dependent upon the communication services selected by the communication device. The plurality of communication services include voice services, video services, data services, facsimile services and electronic mail services. The communication device further comprises means for selecting between a first communication service and a second or additional communication service during a communication with a remote communication device. In one embodiment, the communication device comprises a first module providing a first communication service and a second module detachably coupled to the first module and providing at least a second communication service, wherein said means for selecting occurs when the second module is coupled to the first module during a communication.

Brief Description of the Drawings

FIG. 1 is an illustration in block diagram form of the radio communication system in accordance with the present invention.

FIG. 2 is an illustration of a radio communication unit providing a subset of the possible radio communication services.

FIG. 3 is an illustration of a radio communication unit providing all of the available radio communication services for the radio communication system.

FIG. 4 is an illustration of an alternative radio communication device in accordance with the present device.

FIG. 5 is an illustration of the message exchange between a radio communication unit and a base site transceiver in accordance with the present invention.

Detailed Description of a Preferred Embodiment

The preferred embodiment incorporates a modular radio communication device, wherein different modules provide access to different radio communication services. Upon adding or deleting modules to and from the radio communication unit, the radio communication system re configures the channel providing radio communication services to the radio communication unit. For example, when a voice-only radio communication unit is communicating over a radio channel to a base site transceiver the requirements of the channel bandwidth are minimised. Upon connection of the voice-only radio communication unit to a peripheral device providing simultaneous video, the radio communication unit sends a signal to the base site transceiver updating the service capability. In response thereto, the base site transceiver

modifies the records and adjusts the capabilities of the assigned channel in response to the received signal. Thereby delivering simultaneous video and voice to the radio communication device.

FIG. 1 is an illustration in block diagram form of a radio communication system 100. Radio communication system 100 includes a base site transceiver 101 and a modular radio communication device 103. The modular radio communication device 103 includes an antenna 105, and receiver 107, a transmitter 109, a processor 111, a detector 120, a first user interface 113 making up a first module 123, and a detachably coupled second user interface 115 imbedded in a peripheral device or second module 125.

The base site transceiver 101 sends and receives radio frequency (RF) signals to and from radio communication units within a fixed geographic area. Radio communication device 103 is one such device serviced by the base site transceiver 101 via radio communication channel 117. In the preferred embodiment, the radio communication system is capable of providing voice, video, data, fax, e-mail and text data services over the radio communication channel 117.

Upon a set up of radio communications or an alteration in the radio communication services between the base site transceiver and the radio communication device 103, the base site transceiver configures the communication channels features to provide the services required by the radio communication unit 103. The communication channel features include channel

frequency, modulation format, modulation rate, spreading factor, forward error correction, channel access assignment, transmit power as appropriate and other features known to those familiar with the art.

Upon reception of RF signals by the radio communication device 103 the antenna 105 receives the radio frequency signals converts them into electrical radio frequency signals for reception by the receiver 107. The receiver 107 converts the electrical RF signals into base band signals for use by the processor 111. The processor 111 formats the base band signals into voice, video, or data for use by an user interface. If the second user interface 115 is detached from the portable radio communication unit 103, then the received data is output over the bus 119 to the first user interface 113. In the preferred embodiment, the first user interface 113 provides lower tier communications, such as voice-only to an end user. If the second user interface 115 is coupled to the radio communication unit 103 via databus 121, then the received information is output via the bus 121 to the second user interface 115. Alternatively, the received information can be divided between the first user interface 113 and the second user interface 115. In the preferred embodiment, the second user interface provides higher tier communications including voice with synchronised video and fax data and text reception for display to an end user. Alternatively, the second module 125, may also include a second processor (not shown) for processing received signals related to the communication services provided by the second user interface 115.

Additionally, a similar alteration of the communication services occurs when the second module is decoupled from the first module.

FIG. 2 is an illustration of a radio communication unit 103 of FIG. 1 including only the first user interface 113. In this embodiment, a user may carry this basic voice-only radio communication unit 103 for his private communications in situations when full multi-media communications is not required. It is envisaged that this would occur for a user's personal activities, such as shopping, attending a sporting event, or commuting on the way to work. When the user desires to increase the communication services available, the user may couple a peripheral device 301 containing the second user interface 115 of FIG. 1 to the radio communication unit 103, as illustrated in FIG. 3. It is envisaged that this would occur upon the users arrival at his office. In the preferred embodiment, the peripheral device 301 includes a video display device. Alternatively, as illustrated by a peripheral device 401 of FIG. 4, the peripheral device may include other features such as a higher quality speaker 405 and microphone 403 as well as a higher quality speech decoder (not shown). Alternatively, a user may also desire to decrease the communication services available by decoupling a peripheral device 301, 401 from the radio communication unit 103.

The peripheral devices 301, 401 may be added to or removed from the radio communication device 103 at any time including between communications, during a

communication, or while the radio communication device 103 is powered down. When a communication is originally set up, the radio communication device 103 indicates to the base site transceiver 101 the services that the radio communication device 103 will require during the communication. This indication may be in response to an input from the user of the radio communication device 103 or it may be an indication of the capability of the radio communication device 103. In response to receiving this indication, the base site transceiver 101 assigns a channel to the radio communication device 103. The assigned channel has a given frequency and bandwidth among other known characteristics. The bandwidth of the channel is determined according to the services that are required. For example, if the communication will only involve voice communications, then the bandwidth assigned may be 9.6 kilobits/second. If the communication will involve voice and video communications, then the bandwidth assigned may be 64 kilobits/second. In this description the term bandwidth refers to the data transfer rate allocated by the communication system 100 in order to support the communication services being delivered via a given terminal. An increase in bandwidth in a radio operating environment can be achieved by changing to a modulation scheme with more bits per symbol, and/or increasing the symbol rate and/or allocating more time, and/or allocating more spreading codes.

Once the communication is in progress, the user may couple or decouple a peripheral device to/from the radio

communication device103 to provide a change of communication services. The detector 120 of FIG. 1 detects the coupling/decoupling of the peripheral device to the radio communication device 103. In the preferred embodiment, the radio communication device 103 has a set of electrical contacts exposed on the bottom of the device that are electrically shorted to a metal plate contained on the peripheral device upon coupling/decoupling of the peripheral device 301, 401 to/from the radio communication device 103. Other equally sufficient connector designs can be used. For ease of describing the invention only the term "coupling" used hereinafter shall refer to the acts of coupling to and decoupling from the radio communication device 103. Alternatively, the radio communication device 103 may have a manual trigger switch to provide an indication to the processor 111 that a peripheral device 301, 401 has been coupled to or decoupled from the radio communication unit 103.

Upon coupling, the peripheral device 301, 401, sends a message to the processor 111 of the radio communication device 103 indicating the communication services that the peripheral device 301, 401 supports. In the preferred embodiment this message is the means for selecting the second or additional communication services. However, other means could be provided such as a user selection of the desired services from a menu on the first or second user interface 113, 115. In response to this message, the radio communication device 103 sends an Update Service Capability message 501 to

the base site transceiver 101 over the assigned communication channel, as illustrated in FIG. 5. Upon reception of this message, the base site transceiver 101 analyses the new services that the radio communication unit 103 is requesting and the capabilities of the communication system 100 to handle the desired service. If the appropriate transmission capability is available, then the base site transceiver 101 transmits an Assign New Bearers message 503 to the radio communication unit 103. The Assign New Bearers message 503 includes information such as channel location, bandwidth, and new services provided. Thus, this message provides the means for altering the bandwidth of the communication channel in response to the radio communication device 103 selecting second or additional communication services. In response to receiving this message, the radio communication unit 103 updates the services provided to the user via the peripheral device 301, 401. This adaptation of the radio bearers to match the dynamic capabilities reported by the radio communication device 103 to the base site transceiver 101 allows the communication system 100 to optimise the use of radio capacity whilst fully supporting the changing needs of the user.

If no communications are in progress at the time when the coupling of the peripheral device 301, 401 occurs, then the radio communication device 103 is in Standby Mode. During Standby Mode, it is acceptable to postpone the transmission of the Update Service Capability message 501 until the radio communication

device 103 has other needs to communicate with the base site transceiver 101, such as during a call set up or registration. By postponing the transmission of the message 501, the load on a control channel of the communication system 100 can be minimised without penalty to the user of the communication system 100.

It is essential that when adding new communication services such as video to a voice communication, the two communication services must be synchronised. In a preferred embodiment, when integrated multimedia services (voice and video) are received, as previously discussed, the voice is processed and delivered by the first module 123 and the video is processed and delivered by the second module 125. The speech processing function, Fs, requires a finite period of time, Ts. The video is delivered to the user by the second module 125. The second module performs the video processing function, Fv. This processing requires a second finite period of time, Tv, and must be known to the first module 123. Additionally, the time required for the functions of transferring the video signals in the first module 123, Ftv1, and in the second module 125, Ftv2, for processing and delivery in the second module 125 will take a finite amount of time, Ttv, which must be known to the first module 123 and the second module 125. The first module 123 and the second module 125 are responsible for maintaining the required synchronisation between the communication services utilised in the communication. This synchronisation is achieved by applying a time delay function, Fds, for the

voice related delay, Ds, and a second time delay function, Fdv, for the video related delay, Dv, applied to the related signals prior to output to the respective user interfaces 113, 115. In a preferred embodiment, a means for synchronising the communication services such that the time delays, Ds and Dv, are calculated and applied and the voice and video are received at their respective user interfaces 113, 115 at the same time in the following description. The time delays are dimensioned consistent with the minimising time, Tm, between the reception of the RF signals and the ultimate delivery to the user. This is expressed as Tm = Ts + Ds = Tv + Ttv + Dv where Tm is as small as possible. The dimensioning of time delays is performed at call set up time and also periodically during the communication as it is influenced by information exchanged between the functions Fs, Fv, Ftv1, Ftv2, Fds and Fdv.

What is claimed is:

Claims

1. A communication system comprising:

a communication device capable of communicating using a plurality of communication services;

means for selecting between a first communication service and a second or additional communication service during a communication with a remote communication device; and

a communication channel for providing the communication between the communication device and a base site transceiver, the communication channel having a bandwidth dependent upon a communication service(s) selected from the plurality of communication service provided by the communication device.

2. A communication system in accordance with claim 1 wherein the plurality of communication services include voice services, video services, data services, facsimile services and electronic mail services.

3. A communication system in accordance with claim 1 wherein the communication system further comprises means for altering the bandwidth of the communication channel in response to said communication device selecting a second or additional communication service during a communication with a remote communication device.

4. A communication system in accordance with claim 3 wherein said means for altering the bandwidth is further defined as altering the bandwidth to provide only the bandwidth necessary to handle the communication service(s) selected.

5. A communication system in accordance with claim 1 wherein the communication device further comprises:

a first module providing a first communication service; and

a second module detachably coupled to the first module and providing at least a second communication service, wherein said means for selecting occurs when the second module becomes coupled to the first module during a communication.

6. A communication system in accordance with claim 1 wherein the communication device further comprises:

a first module providing a first communication service; and

a second module detachably coupled to the first module and providing at least a second communication service, wherein said means for selecting occurs when the second module becomes decoupled from the first module during a communication.

7. A communication system in accordance with claim 1 wherein the communication system further comprises means for synchronising video communication services with voice communication services.

8. A communication system in accordance with claim 3 wherein said means for altering further comprises:

means for transmitting, responsive to said means for selecting, an Update Service Capability message to the base site transceiver;

means for receiving the Update Service Capability message at the base site transceiver;

means for analysing the capability of the communication system to handle the second or additional service;

means for transmitting an Assign New Bearers message to the radio communication device indicating channel location, bandwidth, and new services provided; and

means for receiving the Assign New Bearers message at the radio communication device and altering the bandwidth of the communication channel.

9. A communication device as substantially shown and described herein.

The Patent Office

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Application No: GB 9607096.6 **Examiner:** Nigel Hall
Claims searched: all **Date of search:** 16 May 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H4L (LDG,LDSJ,LDSX), H4K (KOD8,KOT)

Int Cl (Ed.6): H04Q 7/22, 7/38

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X,Y	GB 2281174 A	(MOTOROLA) see p.2 lines 8-13	1-3 at least
Y	GB 2265793 A	(GPT) see abstract	1-3 at least
X,Y	US 5349580	(HESTER) see col. 1 lines 26-39 and 55-65	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.